

WHAT IS CLAIMED IS:

1. A polymer foam obtained by highly concentrated internal phase emulsion polymerization,  
5 which is formed from a crosslinked, exclusively hydrocarbon, polymer based on styrenic monomers and which exhibits a density at least equal to  $6 \text{ mg/cm}^3$  and at most equal to  $20 \text{ mg/cm}^3$  and cells with a mean diameter at most equal to 20 microns.  
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2. The polymer foam as claimed in claim 1, in which the polymer is a copolymer of styrene and of divinylbenzene.
- 15 3. The polymer foam as claimed in claim 2, in which the ratio by weight of the styrene to the divinylbenzene in the copolymer is between 4 and 1 and is preferably equal to 1.
- 20 4. The polymer foam as claimed in any one of the preceding claims, which exhibits a mean cell diameter of between 2 and 10 microns.
- 25 5. The polymer foam as claimed in any one of the preceding claims, in which the elements other than the constituent carbon and the constituent hydrogen of the polymer represent less than 3% by weight of the weight of the foam.

6. A process for the manufacture of a polymer foam as claimed in any one of claims 1 to 5, which comprises the following stages:

5 a) producing an emulsion between an organic phase comprising exclusively hydrocarbon styrenic monomers and sorbitan monooleate in ethylbenzene and an aqueous phase comprising an electrolyte and sodium persulfate, the volume of the aqueous phase representing at least 96% of the total  
10 volume of the two phases;

b) polymerizing said monomers until a solid foam is obtained;

c) washing the foam obtained in stage b) and subjecting it to drying with supercritical CO<sub>2</sub>.  
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7. The process as claimed in claim 6, in which the styrenic monomers present in the organic phase are styrene and divinylbenzene monomers.

20 8. The process as claimed in claim 7, in which the ratio by weight of the styrene monomers to the divinylbenzene monomers is between 4 and 1 and is preferably equal to 1.

25 9. The process as claimed in any one of claims 6 to 8, in which the styrenic monomers represent from 40 to 60% by weight of the weight of the organic phase.

30 10. The process as claimed in any one of claims 6 to 9, in which the sorbitan monooleate

represents from 20 to 30% by weight of the weight of the organic phase.

11. The process as claimed in any one of  
5 claims 6 to 10, in which the electrolyte is aluminum sulfate.

12. The process as claimed in any one of  
10 claims 6 to 11, in which the electrolyte represents from 0.1 to 2% by weight of the weight of the aqueous phase.

13. The process as claimed in any one of  
15 claims 6 to 12, in which the sodium persulfate represents from 0.1 to 2% by weight of the weight of the aqueous phase.

14. The process as claimed in any one of  
20 claims 6 to 13, in which the water present in the aqueous phase is ultrapure water.

15. The process as claimed in claim 14, in  
which the ultrapure water present in the aqueous phase has a resistivity of approximately 16.2 megaohms.  
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16. The process as claimed in any one of  
claims 6 to 15, in which the polymerization of the monomers is carried out at a temperature ranging from 30 to 70°C.

17. The process as claimed in any one of claims 6. to 16, in which the washing of the foam comprises one or more washing operations with water, followed by several washing operations with  
5 water/alcohol mixtures with an increasing content of alcohol, themselves followed by one or more washing operations with the alcohol.